

### **Drawing Amendments**

The attached sheets of drawings include changes to FIGs. 1a-1c, 2a, 2e, 3a-3d, 4a-4c, and 5a-5g. These sheets, which include FIGs. 1a-6d, replace the original sheets containing FIGs. 1a-6d.

Attachment: Replacement sheets.

## **REMARKS**

Applicant expresses appreciation to the Examiner for consideration of the subject patent application. This amendment is in response to the Office Action mailed July 6, 2007. Claims 1-7, and 15-27 remain in the application. Claims 1-17 were originally presented. Claims 8-14 have been canceled without prejudice. Claims 1-3, 5 and 15-16 have been amended. Support for the amendments is found on page 6, lines 10-13; page 10, lines 21-24; page 12, lines 3-5; page 14, lines 18-25; and throughout the specification. New claims 18-27 have been added. No new matter has been added. Support for the new claims is clearly found in the specification, the original claims, and in the figures.

### **Oath or Declaration**

A new and corrected oath or declaration is attached as required by the Examiner. The new oath identifies the instant application by number and filing date pursuant to 37 CFR 1.67(a). Additionally, the new oath or declaration states the various sections of 35 USC under which benefit is claimed based on PCT/US04/28890.

### **Priority Claim**

The reference to the prior application was previously submitted within the time period set forth in 37 CFR 1.78(a), in the oath or declaration as discussed above, and the information concerning the benefit claim was recognized by the Office as shown by its inclusion on the first filing receipt. The specification has been amended to include the reference to the prior application in the first sentences of the specification as required by 37 CFR 1.78(a).

### **Drawing Objections**

The drawings were objected to under 37 C.F.R. § 1.83(a) for not showing every feature of the invention specified in the claims. Specifically, the Office Action requires that the "the disc surface with a random surface roughness," and "the disc surface with a patterned surface roughness must be shown or canceled from the claims. Applicant notes that page 8, lines 9-14 of the specification describe that the disc surface indicated by reference character "48" can include a patterned or random surface roughness. Applicant also notes that reference character "48" is

clearly shown in FIGs. 1a, 2a, 2b, 2c, 2d, and 3h. Therefore, Applicant respectfully submits that the drawings show the features of a disc surface with a random surface roughness, and a disc surface with a patterned surface roughness, and requests the objection be withdrawn.

Additionally, the Office Action requires that the opposing rotatable disc surfaces having the same surface roughness, the opposing rotatable disc surfaces being non-parallel, the at least one of the rotatable disc surfaces being non-planar, the opposing rotatable disc surfaces being non-planar, and the discs being different diameters be shown or canceled from the claims. Applicant notes that page 11, lines 6-10 describe opposing disc surfaces having the same or different surface roughnesses, parallel or non-parallel surfaces, planar or non-planar surfaces, and the same or differing diameters. Additionally, page 11, lines 6 and 8 have been amended to clarify that the disc surfaces described therein are in fact the opposing disc surfaces indicated by reference characters “48h and 48i” in FIG. 1b. Moreover, Applicant also notes that FIG. 1b has been amended so that the opposing disc surfaces are correctly indicated by reference characters “48h” and “48i”. Therefore, Applicant respectfully submits that the drawings show the features described above, and requests the objection be withdrawn.

Additionally, the Office Action requires the inlet and outlet passages being perpendicular to the disc surface, and the inlet and outlet passages being inclined to the disc surface be shown or canceled from the claims. FIG. 1a has been amended to show an inlet or outlet passage at 18b that is oriented perpendicular to the disc surface, and an inlet or outlet passage at 18a that is inclined with respect to the disc surface. Additionally, page 10, line 27-28 of the specification have been amended to indicate the perpendicular or inclined inlet and outlet passages are shown by reference characters 18a or 18b. These amendments are supported by page 10, lines 26-28 of the specification and in original claim 6. No new matter has been added. Therefore, Applicant respectfully submits that the drawings now show the features described above, and requests the objection be withdrawn.

Additionally, the Office Action requires the hollow cavity of the shaft having an inner surface with a random surface roughness, and the hollow cavity of the shaft having an inner surface with a patterned surface roughness be shown or canceled from the claims. The paragraph of the specification beginning on page 16, line 5 has been amended to indicate the inner surface of the hollow cavity is shown by reference character 166 in FIG. 5a. Therefore, Applicant

respectfully submits that the drawings show the inner surface as claimed, and requests the objection be withdrawn.

Additionally, the Office Action requires the impeller blade including a leading or trailing edge with a convex curvature be shown or canceled from the claims. This element has been canceled from claim 11. Therefore, Applicant requests the objection be withdrawn.

Additionally, the Office Action requires the plurality of impeller blades with leading or trailing edges with the same surface roughness, and the plurality of impeller blades with leading or trailing edges of different surface roughness be shown or canceled from the claims. The paragraph beginning on page 17, line 11 has been amended to indicate the leading and trailing edges are shown by reference characters “218” and “214”. Reference character “218” is shown in FIG. 5a and reference character “214” is shown in FIG. 5f. Therefore, Applicant respectfully submits that the drawings show the inner surface as claimed, and requests the objection be withdrawn.

The amendments to the drawings and specification discussed above are fully supported by the drawings, specification, and claims as noted above. No new matter has been added. Therefore, applicant respectfully requests the drawing objections be withdrawn.

### **Specification Objections**

A new abstract of the disclosure has been attached as a separate sheet apart from any text in accordance with 37 CFR 1.52(b)(4). Additionally, the abstract has been amended to remove the term “means”. Therefore, Applicant respectfully request withdrawal of the objection to the abstract of the disclosure.

Page 15, line 17 of the specification has been amended to change “carrying” to “carry”. Page 17, line 17 has been amended to change “slots” to “slot”. Therefore, Applicant respectfully requests withdrawal of the objections to the specification.

### **Claim Rejections - 35 U.S.C. § 112**

Claims 2-3, 5, 8, and 11 stand rejected under § 112, 2nd paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as

the invention. Specifically, the Office Action asserts that claims 2, 3, and 5 contain features that are conflicting/not possible because the various claimed members are different embodiments. As suggested by the Office Action, claims 2, 3, and 5 have been amended, as discussed above, to change the phrase “at least one” to “a” or “an”. Claims 8 and 11 have been canceled. Thus, Applicant respectfully requests withdrawal of the objections to the claims.

### **Claim Rejections - 35 U.S.C. § 102**

Claims 1-3, 7 and 15 (including independent claims 1 and 15) were rejected under 35 U.S.C. § 102(b) as being anticipated by Mauron (U.S. Patent No. 1,586,160).

The Mauron reference fails to disclose a pump with an inlet, an outlet, a fluid passage, and a disc with a disc surface that are oriented parallel to one another to form a planar structure through which fluid can flow. Instead, Mauron shows a pump with an inlet “d” that is perpendicular to the outlet “e”.

In contrast, independent claim 1 sets forth:

“A pump device, comprising a pump housing with an inlet, an outlet, and a fluid passage through which a fluid can pass; at least one rotatable disc rotatably disposed in the pump housing, having a rotatable disc surface ... ; and the disc surface, inlet, outlet, and fluid passage being oriented parallel to one another to form a planar structure through which a fluid can pass with the rotatable disc surface rotatable parallel to the flow of fluid through the planar structure.”

Similarly, independent claim 15 sets forth:

“A pump device, comprising a pump housing with an inlet, an outlet, and a fluid passage through which a fluid can pass; at least one disc, rotatably disposed in the pump housing, having a rotatable disc surface; ... the inlet, the outlet, the fluid passage, and the disc surface forming a substantially planar flow structure to direct fluid flow parallel to the rotational disc surface.”

The elements of a disc surface, inlet, outlet and fluid passage being oriented parallel to one another to form a planar fluid flow passage are not taught in any of the cited references, and provide the advantages of reducing interference in the flow of the fluid, reducing pressure and flow losses, and increasing efficiency of the pump

In contrast, the Mauron reference fails to show such a planar flow passage. In fact, since Mauron teaches fluid flow into the pump that is perpendicular to the direction of rotation of the pump impellers, Mauron is the type of pump the present invention is seeking to improve.

Thus, Mauron does not teach each and every element of independent claims 1 and 15 because Mauron does not teach a planar flow passage. Therefore, Applicant respectfully submits that claims 1-3, 7 and 15 are allowable, and urges the Examiner to withdraw the rejection.

Claims 1-3, 7 and 15 (including independent claims 1 and 15) were rejected under 35 U.S.C. § 102(b) as being anticipated by Turner (U.S. Patent No. 3,535,051).

The Turner reference fails to disclose a pump with an inlet, an outlet, a fluid passage, and a disc with a disc surface that are oriented parallel to one another to form a planar structure through which fluid can flow. Instead, Turner shows a pump with an inlet “15” that is perpendicular to the outlet “6” and “6a”.

As noted above, and in contrast to Turner, independent claims 1 and 15 of the present invention set forth a pump with an inlet, outlet, disc surface, and fluid passage that are parallel to one another and form a planar fluid flow structure. Turner does not teach such a planar flow passage. In fact, since Turner teaches fluid flow into the pump that is perpendicular to the direction of rotation of the pump impellers, Turner is also the type of pump the present invention is seeking to improve.

Thus, Turner does not teach each and every element of independent claims 1 and 15 because Turner does not teach a planar flow passage. Therefore, Applicant respectfully submits that claims 1-3, 7 and 15 are allowable, and urges the Examiner to withdraw the rejection.

Claims 1-5, 7 and 15 (including independent claims 1 and 15) were rejected under 35 U.S.C. § 102(b) as being anticipated by Caldwell (U.S. Patent No. 3,250,458).

The Caldwell reference fails to disclose a pump with an inlet, an outlet, a fluid passage, and a disc with a disc surface that are oriented parallel to one another to form a planar structure through which fluid can flow. Instead, Caldwell shows a pump with an inlet “23” that is perpendicular to the outlet “27”.

As noted above, and in contrast to Caldwell, independent claims 1 and 15 of the present invention set forth a pump with an inlet, outlet, disc surface, and fluid passage that are parallel to one another and form a planar fluid flow structure. Caldwell does not teach such a planar flow passage. In fact, since Caldwell teaches fluid flow into the pump that is perpendicular to the

direction of rotation of the pump impellers, Caldwell is also the type of pump the present invention is seeking to improve.

Thus, Caldwell does not teach each and every element of independent claims 1 and 15 because Caldwell does not teach a planar flow passage. Therefore, Applicant respectfully submits that claims 1-5, 7 and 15 are allowable, and urges the Examiner to withdraw the rejection.

Claims 1-5, 7 and 15 (including independent claims 1 and 15) were rejected under 35 U.S.C. § 102(b) as being anticipated by Mase (U.S. Patent No. 4,668,160).

The Mase reference fails to disclose a pump with an inlet, an outlet, a fluid passage, and a disc with a disc surface that are oriented parallel to one another to form a planar structure through which fluid can flow. Instead, Mase shows a pump with an inlet “1A” that is perpendicular to the outlet “1B”.

As noted above, and in contrast to Mase, independent claims 1 and 15 of the present invention set forth a pump with an inlet, outlet, disc surface, and fluid passage that are parallel to one another and form a planar fluid flow structure. Mase does not teach such a planar flow passage. In fact, since Mase teaches fluid flow into the pump that is perpendicular to the direction of rotation of the pump impellers, Mase is also the type of pump the present invention is seeking to improve.

Thus, Mase does not teach each and every element of independent claims 1 and 15 because Mase does not teach a planar flow passage. Therefore, Applicant respectfully submits that claims 1-5 and 15 are allowable, and urges the Examiner to withdraw the rejection.

Claims 1-7 and 15 (including independent claims 1 and 15) were rejected under 35 U.S.C. § 102(b) as being anticipated by Narita (U.S. Patent No. 4,732,529).

The Narita reference fails to disclose a pump with an inlet, an outlet, a fluid passage, and a disc with a disc surface that are oriented parallel to one another to form a planar structure through which fluid can flow. Instead, Narita shows a pump with an inlet “A” that is perpendicular to the rotatable disc surface, that is the surface of rotor “2” or rotor blades “2II”.

As noted above, and in contrast to Narita, independent claims 1 and 15 of the present invention set forth a pump with an inlet, outlet, disc surface, and fluid passage that are parallel to one another and form a planar fluid flow structure. Narita does not teach such a planar flow passage. In fact, since Narita teaches fluid flow into the pump that is perpendicular to the direction of rotation of the pump impellers, Narita is also the type of pump the present invention is seeking to improve.

Thus, Narita does not teach each and every element of independent claims 1 and 15 because Narita does not teach a planar flow passage. Therefore, Applicant respectfully submits that claims 1-7 and 15 are allowable, and urges the Examiner to withdraw the rejection.

Claims 1-3, 7 and 15 (including independent claims 1 and 15) were rejected under 35 U.S.C. § 102(b) as being anticipated by Hartman (U.S. Patent No. 2,245,035).

The Hartman reference fails to disclose a pump with an inlet, an outlet, a fluid passage, and a disc with a disc surface that are oriented parallel to one another to form a planar structure through which fluid can flow. Instead, Hartman shows a pump with an inlet “37” that is perpendicular to the outlet “12”.

As noted above, and in contrast to Hartman, independent claims 1 and 15 of the present invention set forth a pump with an inlet, outlet, disc surface, and fluid passage that are parallel to one another and form a planar fluid flow structure. Hartman does not teach such a planar flow passage. In fact, since Hartman teaches fluid flow into the pump that is perpendicular to the direction of rotation of the pump impellers, Hartman is also the type of pump the present invention is seeking to improve.

Thus, Hartman does not teach each and every element of independent claims 1 and 15 because Hartman does not teach a planar flow passage. Therefore, Applicant respectfully submits that claims 1-3, 7 and 15 are allowable, and urges the Examiner to withdraw the rejection.

Claims 1-3, 7 and 15 (including independent claims 1 and 15) were rejected under 35 U.S.C. § 102(b) as being anticipated by Villard (U.S. Patent No. 4,242,039).



The Villard reference fails to disclose a pump with an inlet, an outlet, a fluid passage, and a disc with a disc surface that are oriented parallel to one another to form a planar structure through which fluid can flow. Instead, Villard shows a pump with an inlet “9” that is perpendicular to the outlet “12”.

As noted above, and in contrast to Villard, independent claims 1 and 15 of the present invention set forth a pump with an inlet, outlet, disc surface, and fluid passage that are parallel to one another and form a planar fluid flow structure. Villard does not teach such a planar flow passage. In fact, since Villard teaches fluid flow into the pump that is perpendicular to the direction of rotation of the pump impellers, Villard is also the type of pump the present invention is seeking to improve.

Thus, Villard does not teach each and every element of independent claims 1 and 15 because Villard does not teach a planar flow passage. Therefore, Applicant respectfully submits that claims 1-3, 7 and 15 are allowable, and urges the Examiner to withdraw the rejection.

Claims 1-9 and 13 (including independent claim 1) were rejected under 35 U.S.C. § 102(b) as being anticipated by Negishi (U.S. Patent No. 5,297,926). Claims 8-9, and 13 have been canceled.

The Negishi reference fails to disclose a pump with an inlet, an outlet, a fluid passage, and a disc with a disc surface that are oriented parallel to one another to form a planar structure through which fluid can flow. Instead, Negishi shows a pump with an inlet “2” that is perpendicular to the outlet “6”.

As noted above, and in contrast to Negishi, independent claim 1 of the present invention set forth a pump with an inlet, outlet, disc surface, and fluid passage that are parallel to one another and form a planar fluid flow structure. Negishi does not teach such a planar flow passage. In fact, since Negishi teaches fluid flow into the pump that is perpendicular to the direction of rotation of the pump impellers, Negishi is also the type of pump the present invention is seeking to improve.

Thus, Negishi does not teach each and every element of independent claims 1 and 15 because Negishi does not teach a planar flow passage. Therefore, Applicant respectfully submits that claims 1-7 and 15 are allowable, and urges the Examiner to withdraw the rejection.

Claims 1-9 (including independent claim 1) were rejected under 35 U.S.C. § 102(b) as being anticipated by Kardas (U.S. Patent No. 4,452,566). Claims 8-9 have been canceled.

The Kardas reference fails to disclose a pump with an inlet, an outlet, a fluid passage, and a disc with a disc surface that are oriented parallel to one another to form a planar structure through which fluid can flow. Instead, Kardas shows a pump with an inlet “44” that is perpendicular to the outlet “38”.

As noted above, and in contrast to Kardas, independent claim 1 of the present invention set forth a pump with an inlet, outlet, disc surface, and fluid passage that are parallel to one another and form a planar fluid flow structure. Kardas does not teach such a planar flow passage. In fact, since Kardas teaches fluid flow into the pump that is perpendicular to the direction of rotation of the pump impellers, Kardas is also the type of pump the present invention is seeking to improve.

Thus, Kardas does not teach each and every element of independent claims 1 and 15 because Kardas does not teach a planar flow passage. Therefore, Applicant respectfully submits that claims 1-7 are allowable, and urges the Examiner to withdraw the rejection.

Claims 1-12 and 16 (including independent claims 1 and 16) were rejected under 35 U.S.C. § 102(b) as being anticipated by Eskeli (U.S. Patent No. 3,828,553). Claims 8-12 have been canceled.

The Eskeli reference fails to disclose a pump with an inlet, an outlet, a fluid passage, and a disc with a disc surface that are oriented parallel to one another to form a planar structure through which fluid can flow. Instead, Eskeli shows a pump with an inlet “20” that is perpendicular to the outlet “17”.

As noted above, and in contrast to Eskeli, independent claim 1 of the present invention set forth a pump with an inlet, outlet, disc surface, and fluid passage that are parallel to one another and form a planar fluid flow structure. Eskeli does not teach such a planar flow passage. In fact, since Eskeli teaches fluid flow into the pump that is perpendicular to the direction of rotation of the pump impellers, Eskeli is also the type of pump claim 1 of the present invention is seeking to improve.

Thus, Eskeli does not teach each and every element of independent claim 1 because Eskeli does not teach a planar flow passage.

With respect to claim 16, the Eskeli reference fails to disclose a pump with rotatable hollow shaft with an inner rotating surface of the shaft having means for transferring rotational momentum to the fluid by viscous forces and imparting centrifugal forces to the fluid. Instead, Eskeli teaches a pump with hollow shaft that that passes to an inner rotor cavity where fluid is accelerated to the rotor speed.

In contrast, independent claim 16 sets forth:

“A pump device, comprising a pump housing; a rotatable shaft, rotatably disposed in the housing; a hollow cavity, formed in the shaft;...and an inner rotating surface of the shaft including means for transferring rotational momentum to the fluid by viscous forces and imparting centrifugal forces to the fluid.”

The elements of an inner rotating surface of the shaft with means for transferring rotational momentum and centrifugal forces to the fluid are not taught in the Eskeli reference. In fact, because Eskeli is silent with respect to the inner surface of the shaft, it is unclear to Applicant how the inner surface of the shaft might interact with the fluid flowing through the shaft.

Thus, Eskeli does not teach each and every element of claim 16 because Eskeli does not teach an inner rotating surface of the shaft with means for transferring rotational momentum and centrifugal forces to the fluid. Therefore, Applicant respectfully submits that claims 1-7 and 16 are allowable, and urges the Examiner to withdraw the rejection.

Claims 1-11 and 16 (including independent claims 1 and 16) were rejected under 35 U.S.C. § 102(b) as being anticipated by Valley (U.S. Patent No. 590,247). Claims 8-11 have been canceled.

The Valley reference fails to disclose a pump with an inlet, an outlet, a fluid passage, and a disc with a disc surface that are oriented parallel to one another to form a planar structure through which fluid can flow. Instead, Valley shows a pump with an inlet “M” that is perpendicular to the outlet “A”.

As noted above, and in contrast to Valley, independent claim 1 of the present invention set forth a pump with an inlet, outlet, disc surface, and fluid passage that are parallel to one another and form a planar fluid flow structure. Valley does not teach such a planar flow passage. In fact, since Valley teaches fluid flow into the pump that is perpendicular to the direction of rotation of the pump impellers, Valley is also the type of pump claim 1 of the present invention is seeking to improve.

Thus, Valley does not teach each and every element of independent claim 1 because Valley does not teach a planar flow passage.

With respect to claim 16, the Valley reference fails to disclose a pump with rotatable hollow shaft with an inner rotating surface of the shaft having means for transferring rotational momentum to the fluid by viscous forces and imparting centrifugal forces to the fluid. Instead, Valley teaches a pump with hollow shaft that that passes to an inner rotor cavity where fluid is escapes through ports “B3” thereby turning a disc “B2”.

In contrast, independent claim 16 sets forth:

“A pump device, comprising a pump housing; a rotatable shaft, rotatably disposed in the housing; a hollow cavity, formed in the shaft;...and an inner rotating surface of the shaft including means for transferring rotational momentum to the fluid by viscous forces and imparting centrifugal forces to the fluid.”

The elements of an inner rotating surface of the shaft with means for transferring rotational momentum and centrifugal forces to the fluid are not taught in the Valley reference. In fact, because Valley is silent with respect to the inner surface of the shaft, it is unclear to Applicant how the inner surface of the shaft might interact with the fluid flowing through the shaft.

Thus, Valley does not teach each and every element of claim 16 because Valley does not teach an inner rotating surface of the shaft with means for transferring rotational momentum and centrifugal forces to the fluid. Therefore, Applicant respectfully submits that claims 1-7 and 16 are allowable, and urges the Examiner to withdraw the rejection.

### **Claim Rejections - 35 U.S.C. § 103**

Claims 13-14 and 17 were rejected under 35 U.S.C. § 103 as being unpatentable over Eskeli in view of Negishi. Claims 13 and 14 have been canceled.

With respect to claim 17, as discussed above, independent claim 16, from which claim 17 depends, sets forth a pump device with a hollow shaft having an inner rotating surface of the shaft with means for transferring rotational momentum and centrifugal forces to the fluid. Eskeli does not teach an inner rotating surface of the shaft with means for transferring rotational momentum and centrifugal forces, and Negishi does not overcome that deficiency.

Thus, the combination of Eskeli with Negishi does not teach each and every element of claim 16 of the present invention, and Applicant respectfully submits that claim 16 is allowable. Therefore, claim 17 is allowable for at least its dependence on an allowable independent claim, and Applicant urges the Examiner to withdraw the rejection.

Claims 14 was rejected under 35 U.S.C. § 103 as being unpatentable over Negishi. Claim 14 has been canceled.

## CONCLUSION

In light of the above, Applicant respectfully submits that pending claims 1-7, and 15-27 are now in condition for allowance. Therefore, Applicant requests that the rejections and objections be withdrawn, and that the claims be allowed and passed to issue. If any impediment to the allowance of these claims remains after entry of this Amendment, the Examiner is strongly encouraged to call Garron M. Hobson at (801) 566-6633 so that such matters may be resolved as expeditiously as possible.

10 claims were added (claims 18-27), including 1 independent claim (claim 25), while 7 claims were canceled (claims 8-14). Therefore, an additional fee of 105 is due.

Check No. 2999 in the amount of \$335, is enclosed pursuant to 37 C.F.R. § 1.17(a), for a 2 month extension of time pursuant to 37 C.F.R. § 1.136, and for the additional claim fee.

The Commissioner is hereby authorized to charge any additional fee or to credit any overpayment in connection with this Amendment to Deposit Account No. 20-0100.

DATED this 5 day of Dec, 2007.

Respectfully submitted,



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